What is claimed is:

1. A memory device of chalcogenide phase-change non-volatile memory, comprising;

a top electrode;

a bottom electrode; and

a phase-change thin film between the top electrode and the bottom electrode, wherein the phase-change thin film is a chalcogenide alloy doped with an element therein, and the element enhances a crystallization rate of the chalcogenide alloy.

2. The memory device of claim 1, wherein the element includes Tin (Sn).

3. The memory device of claim 1, wherein a mole ratio of the element within the chalcogenide alloy is from about 0.1% to about 90%.

4. The memory device of claim 3, wherein the mole ratio of the element within the chalcogenide alloy is lower than 10%.

5. The memory device of claim 1, wherein the chalcogenide alloy is $Ge_2Sb_2Te_5$.

6. A method of fabricating a memory device of chalcogenide phase-change non-volatile memory, comprising;

forming a bottom electrode;

forming a phase-change thin film on the bottom electrode, wherein the phase-changed thin film is a chalcogenide alloy doped with an element, and the element enhances the crystallization rate of the chalcogenide alloy; and

forming a top electrode on the phase-change thin film.

7. The method of fabricating a memory device of claim 6, wherein the method of forming the phase-change thin film is performed by a sputtering process using a chalcogenide target doped with the element therein.

8. The method of fabricating a memory device of claim 6, wherein the method of forming the phase-change thin film is performed by a co-sputtering process using a target having the element and a chalcogenide target.

9. The method of fabricating a memory device of claim 6, wherein the method of forming the phase-change thin film of the chalcogenide alloy doped with the element therein is performed by an ion-implantation process.

10. The method of fabricating a memory device of claim 6, wherein the method of forming the phase-change thin film of the chalcogenide alloy doped with the element therein is performed by a diffusion process.

11. The method of fabricating a memory device of claim 6, wherein the method of forming the phase-change thin film is performed by a co-evaporation process using the chalcogenide alloy and the element.

12. The method of fabricating a memory device of claim 6, wherein the element includes Tin (Sn).

13. A chalcogenide phase-change non-volatile memory, comprising:

a word-line;

a bit-line, which is electrically coupled to the word-line;

a selective device, which is electrically coupled to the word-line and the bit-line; and

a memory device, which is electrically coupled to the selective device, wherein the memory device comprises a top electrode, a bottom electrode and a phase-change thin film between the top electrode and the bottom electrode, and the phase-change thin film is a chalcogenide alloy doped with an element therein, the element enhancing the crystallization rate of the chalcogenide alloy.

14. The chalcogenide phase-change non-volatile memory of claim 13, wherein the element includes Tin (Sn).

15. The chalcogenide phase-change non-volatile memory of claim 13, wherein a mole ratio of the element within the chalcogenide alloy is from about 0.1% to about 90%.

16. The chalcogenide phase-change non-volatile memory of claim 15, wherein the mole ratio of the element within the chalcogenide alloy is less than 10%.

17. The chalcogenide phase-change non-volatile memory of claim 13, wherein the chalcogenide alloy is $Ge_2Sb_2Te_5$.